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IONOSPHERE STORMS AND RADIO TRANSMISSION BETWEEN NORTH AMERICA AND EUROPE

A joint study of radio transmission, involving radio measurements in Argentina and the United States, coordinated with similar measurements in Europe, has been in progress since 1935. A paper on this subject, prepared jointly by A. T. Cosentino of the Ministry of the Interior, Argentina, and J. H. Dellinger, Chief of the Bureau's Radio Section, was presented at the Eighth American Scientific Congress in Washington last May. A remarkable anomaly in long-distance broadcast transmission had been indicated by certain observations in 1932, viz: much lower received wave intensities for transmission across the North Atlantic Ocean between Europe and North America than for transmission over the same distances within North America, Europe, or Asia. The present study was made to determine what happens on transmission paths between South America and the other continents, and has yielded an explanation of the North Atlantic anomaly.

The work was confined to the northern winters or southern summers, because it is only at that time of year that there is an opportunity to make observations in the Americas on radio broadcasting from Europe. Radio transmission at broadcast frequencies occurs over great distances only at night, and it is only in December and adjacent months that there are periods when local interference is absent and night prevails throughout the region between Europe and eastern North America or Argentina.

The work has established the fact that radio transmission between South America and either North America or Europe is relatively free from influences that seriously impair transmission between North America and Europe. For the time of year at which

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the measurements were made (northern winter or southern summer), the received intensities for transmission between North America and South America average approximately 25 times the intensities between North America and Europe, and are only about one-fifteenth as variable.

The conditions of low and variable received intensity are characteristic of radio transmission over any path at times of ionosphere storms. Since the North America-Europe transmission path is near the magnetic pole and auroral zone, where ionosphere storms have maximum effects, that path is thus markedly subject to ionosphere storms, even relatively slight ones which would have no effect on transmission over paths farther south. The effect occurs at high as well as broadcast frequencies and is so marked that it is commonly impossible to communicate directly between North America and Europe during ionosphere storms, and radio traffic is then actually carried on by relaying through Buenos Aires. As these conditions prevail for several days, the North America-Europe transmission path is almost never entirely free from ionospheric storminess. The prevalence of ionospheric storminess in the transmission path appears to present a complete explanation of the unsatisfactory transmission between North America and Europe.

PREDICTION OF USEFUL DISTANCES FOR AMATEUR RADIO COMMUNICATION

A paper by Newbern Smith and S. S. Kirby to be published in QST gives predictions of minimum and maximum distances of radio transmission in the four amateur frequency bands which will be regularly useful for long-distance communication during August and September. They are in the form of graphs giving averages for the minimum and maximum useful distances for the different hours of the day for each month. The 2-, 4-, 7-, and 14-Mc bands are the four bands shown. The predictions are based on past measurements of ionosphere characteristics and radio-station intensities, which give data on diurnal, seasonal, and year-to-year variations. The Bureau plans the regular publication of these predictions on a quarterly basis.

AN AUTOMATIC WEATHER STATION

Radio has made possible the collection of weather data from completely automatic stations installed at isolated locations, such as mountain peaks and small islands, which transmit meteorological information at predetermined intervals.

In the August Journal of Research (RP1318), Harry Diamond and Wilbur S. Hinman, Jr., describe an automatic weather station which utilizes the same principle as the radio sonde. The variation in the meteorological element is converted into a change in resistance which in turn produces a change in modulation frequency. The essential difference lies in the use of much lower frequencies, 0.15 to 3.0 cycles per second. The low frequencies allow mechanical keying of a conventional radiotelegraph transmitter; complicated modulating equipment is, therefore, unnecessary. A manual counting method of simple electrical counters may be used at the receiving end for evaluating the observations. An experimental station of this type, installed at the Naval Air Station, Anacostia, D. C., on April 1, 1940, has since been in daily operation.

The experimental station includes a 15-watt radio transmitter with battery power supply; instruments for measuring pressure, temperature, humidity, wind direction and velocity, and rainfall; means for converting the instrument deflections into corresponding variable resistors; modulating equipment for keying the radio transmitter at a rate depending on the value of the particular variable resistor in circuit; automatic control equipment for connecting the instrument resistors into circuit in a definite sequence and for identifying the several observations by appropriate code letters; and a timing clock for starting the equipment at scheduled times.

The pressure, humidity, and rain gage instruments are of standard design, the rain gage being of the weighing type. In each instrument, a relay-operated clamping bar is added for clamping the instrument pointer against the edge of a wire-wound resistor when an observation from that instrument is desired; this provides the means for converting the instrument deflection into a resistance variation. The instrument pointer is thus allowed to swing freely except when an observation is being transmitted.

The temperature element is a glass capillary tube filled with an electrolyte having a high temperature coefficient of electrical resistance; the resistance of this device is thus a function of the ambient temperature.

The wind direction indicator (of standard type) has eight contact seg-

ments corresponding to the eight principal compass points. A different fixed resistor is connected to each segment and thrown into circuit when the wind vane assumes that direction. Directions intermediate to any two principal directions are indicated by taking advantage of the oscillation of the wind vane about its average position; such oscillation tends to connect into circuit successively, on a proportional basis, the two resistors corresponding to the adjacent principal directions. The average value of the resultant keying frequency thus lies between the values for the two principal directions considered.

The wind-velocity indicator is a standard commercial cup anemometer with the "take-off" contacts stepped up by a factor of four, so that four contacts per minute correspond to 1 knot. These contacts are made to key the radio transmitter directly.

The automatic control equipment is arranged to allow a warm-up period for the transmitter after starting, next to send out the station call letters, a reference frequency, and finally the several observation frequencies corresponding to the desired measurements, each preceded by an identifying code. The sequence is repeated twice. Special cams provide that signals start at the beginning of the first sequence and do not stop before the end of the second sequence.

A month's automatic operation of the experimental station has shown the system to be reliable mechanically and electrically. The average errors obtained in the measurements without regard to sign were: Barometric pressure, 1.5 millibars; temperature, 0.5° C; relative humidity, 4 percent; wind direction, none for the eight primary compass points with effective indication of intermediate points; wind velocity, less than 1 knot; rainfall, 0.02 inch (estimated).

The receiving equipment consists, in the simplest case, of an ordinary radio receiver, headphones, and stop watch. Accordingly, the observations may be obtained by field crews; often an advantageous feature.

SAFETY RULES FOR THE INSTALLATION AND MAINTENANCE OF ELECTRIC SUPPLY STATIONS

Handbook H31, which has just been issued, contains a revision of Part 1 of the National Electrical Safety Code, Rules for the Installation and Maintenance of Electric Supply Stations. These rules deal with the general protective arrangement of equipment, including oil-filled apparatus, rotating machinery, storage batteries, and with such protective devices as fuses, circuit-breakers, switches, controllers, and lightning arresters. Separate sections are devoted to conductors and switchboards.

Statements have been reworded to clarify them, but most of the rules have not been changed in substance. However, those on storage batteries have been completely revised, and the rules for transformers now recognize the use of a noncombustible cooling liquid which is one of the modern developments of the art.

Revised rules for the protective grounding of circuits and equipment are included; these comprise section 9 of the code. The changes are mostly of a minor character, although the conditions for the interconnection of primary lightning arresters with the secondary neutral have been liberalized.

Copies of H31 are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

STANDARD RESISTORS

The Bureau is frequently called upon to compare precision resistors with its own standards. Information pertinent to these resistance measurements has been accumulating for 30 years. In the August Journal of Research (RP1323), Frank Wenner presents in connected form the more important parts of this information, not adequately explained in previous publications.

The paper is intended to give college students, and others of limited experience in electrical measurements, an understanding of the Wheatstone bridge and of the Thomson bridge, and those actually engaged in making precise resistance comparisons an understanding of the precautions necessary to obtain a precision of the order of 1 part in a million with resistors having values in the range from 0.0001 ohm to 10,000 ohms.

The sensitivity of bridges is discussed rather fully, and the reason why the sensitivity decreases as the precision of the comparisons is increased is explained. The more important factors limiting the precision, such as terminals and contacts, thermoelectromotive forces, insulation, and the optical system of the galvanometer, are given due consideration. Methods, apparatus, and procedures used at the Bureau in precise comparisons of resistance receive special attention. Some explanation is

given of the methods of analysis used in the paper, and it is shown how the independent resistances of a nonlinear four-terminal conductor constituting a part of a network may be taken into account. This is followed by a brief discussion of Ohm's law from the standpoint of precise resistance comparisons and a brief discussion of units of resistance. Finally, reference is made to more than 100 publications having a more or less direct bearing on the subject of resistance measurements.

REMOVAL OF STATIC CHARGES FROM CHEMICAL GLASSWARE

The static charge acquired by chemical glassware when wiped may cause a serious error in weighing the vessel, this difficulty being particularly pronounced during the winter months when the moisture content of the atmosphere is low.

For instance, in the Pregl method for the microchemical determination of carbon and hydrogen, the absorption tubes are wiped with a chamois. This causes a static charge that leaks off so slowly, when the humidity is low, that the time schedule (usually 10 to 15 minutes) between completing a combustion and weighing the absorption tubes cannot be maintained.

F. W. Van Straten and W. F. Ehret state that the charge can be removed by the high-frequency discharge from a device commonly used to detect pinholes in evacuated apparatus. Clement J. Rodden of the Bureau's Chemistry Division has found that if ultraviolet light is used to ionize the air surrounding a glass vessel, the charge can readily be dissipated. In experiments at the Bureau, the vessel was wiped with a dry chamois and was considered to have reached constant weight when the variation was less than 0.05 mg, using a macrobalance. Weighings were made usually after 5-minute interval exposure to the light. In some instances this was reduced to 2 minutes. As a safe general rule it is recommended that the wiped article be placed about 2 feet from either a Hanovia Alpine Sun Lamp or General Electric Lab-Arc, for 10 minutes.

EFFECT OF HEATING RATE ON AUSTENITIC GRAIN SIZE

In a paper by Samuel J. Rosenberg and Thomas G. Digges in the Journal of Research for August (RP1322) data are presented to show how the rate of heating through the transformation range affects the austenitic grain size at various temperatures of high-purity alloys of iron and carbon and commercial and experimental plain carbon steels. The commercial steels included heats produced under furnace practice that resulted in both controlled and noncontrolled grain size. In certain cases, the austenitic grain size of these alloys and steels was affected by the rate of heating through the transformation range, but all the materials did not respond in the same manner.

IMPROVEMENTS IN PREPARATION OF α-GALACTURONIC ACID

Previous investigations, principally by Ehrlich and by Link, have demonstrated that many important carbohydrates from plants (particularly the pectins) are primarily polymers of α-galacturonic acid. The widespread occurence of this acid and its properties, which are those of both a sugar and an aldonic acid, make it of considerable interest. Many methods have been devised for obtaining the crystalline acid but, until recently, it has been a rare and expensive material. Both acids and enzymes have been used to hydrolyze the polysaccharides but the use of enzymes seems the best procedure since the uronic acids are readily decomposed by hot mineral acids. Ehrlich has reported an enzymatic method which gives high yields of α-galacturonic acid but the material and enzyme preparations used are not easily obtained. Recently Mottern and Cole have described a similar method which utilizes the commercially available citrus pectic acid of the California Fruit Growers Exchange, and a commercial pectinase preparation. The yields obtained, however, were only 30 to 37 percent.

The National Bureau of Standards has been interested in the preparation of α-galacturonic acid as an intermediate in the synthesis of certain sugar derivatives. W. W. Pigman of the Bureau's Polarimetry Section has now found that the Mottern and Cole method may be greatly improved by the use of methyl alcohol instead of ethyl alcohol as a solvent, and yields of more than 67 percent of the theoretical are usually obtained.

SYNTHETIC RUBBER

Synthetic rubber has now been used commercially for about 10 years. A summary of facts and figures on this

subject is presented by Lawrence A. Wood in a new Bureau Circular, C427, entitled, "Synthetic Rubbers: A Review of Their Compositions, Properties, and Uses." The paper also appeared in the July issued of the India Rubber World. The most active research has been carried on in Germany, Russia, and the United States. In the first two countries the primary aim seems to have been to duplicate, or nearly duplicate, the properties of natural rubber; in the United States, on the other hand, the apparent objective has been to produce a product superior to natural rubber in some respect, so as to justify, in a free market, the higher cost, which is in most cases at least three or four times that of natural rubber. Recent international events have somewhat changed the American viewpoint, but have not as yet had an influence on the development of synthetic rubber in this country.

The survey lists about 30 varieties of synthetic rubber, almost all of which are in present commercial production. The varieties are grouped in six general classes, according to chemical composition, and the discussion follows this classification. The classes are (1) chloroprene polymers, (2) butadiene polymers, including copolymers, (3) organic polysulphides, (4) isobutene polymers, (5) plasticized vinyl chloride polymers, and (6) dimethyl butadiene polymers. Familiar examples of each of these types are, respectively, (1) Neoprene, (2) the German Buna rubbers, (3) Thickol, (4) Vistanex, (5) Koroseal, and (6) "methyl rubber." Since the last type is chiefly of historical interest, it is treated only briefly. For each of the first five types, information is given concerning the raw materials used in production, the chemical reactions of manufacture, and the general conditions of polymerization. There is also some discussion of the compounding and vulcanization of the different types and of the properties and uses of the product.

Published values of the properties of the different varieties of synthetic rubber are summarized in comparative form, especially those properties which can be expressed by fundamental numerical values. Tables include published values of density, refractive index, identity period along the fiber axis, swelling in liquids, tensile strength, and permeabilities to water and to hydrogen. Values of dielectric constant, power factor, and resistivity are also given. In Germany and Russia synthetic rubber is used to displace natural rubber in all its applications; in other countries, especially the United States, only those applications for which natural rubber is notably deficient have, so far, been of importance. Synthetic rubbers can be made to show great superiority to natural rubber in resistance to the effects of liquids, particularly petroleum products, and to deterioration by exposure to light, heat, ozone, and oxygen. A bibliography of over 200 references is given, listing scientific literature on this subject during the decade 1930–40.

Orders for C427 should be sent to the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 10 cents.

STABILITY OF LEATHER AT ELEVATED TEMPERATURES

For some time investigations have been in progress at the Bureau on the factors which affect the deterioration of leather, in order to develop a suitable accelerated aging test. The results of this work indicate that when vegetable-tanned leather is exposed in an atmosphere of oxygen under pressure in a bomb at elevated temperature, the deterioration parallels that of normal aging.

Although the bomb test showed considerable promise, several disadvantages were evident. The operation of a test under pressure requires special equipment. Part of the deterioration in the bomb is caused by moisture formed from the oxidation of the tanning materials, but this factor cannot be conveniently controlled.

In an investigation by Joseph R. Kanagy, a commercial leather and leathers tanned with sumac, chestnut, quebracho, cutch, and a blend of chestnut, sulfited quebracho and cutch were heated to temperatures from 67° to 130° C in dry helium, in dry air, and in dry oxygen at atmospheric pressure. The effect of varying the concentration of water vapor was studied with chestnut and quebracho leathers at 100° C. The loss of tensile strength and the increase in the nitrogenous materials extractable in 0.1 *N* sodium carbonate solution were used as measures of the deterioration, the former being regarded as the more reliable. Raising the temperature increased the deterioration under all circumstances. In air, deterioration was more rapid than in the inert gas (helium), and in oxygen it was more rapid than in air. The logarithm of the percentage loss in tensile strength of the dry leather increased linearly with the duration of heating in air. The effect of humidity was small for samples hav-

ing a pH greater than 3 but increased rapidly at lower pH values.

This method of aging, which is described in detail in the August Journal of Research (RP1319), is believed to be an improvement over aging in the oxygen bomb because it permits a more convenient control of the factors involved. The essential features of an accelerated aging test for leather are an elevated temperature and an oxidizing atmosphere containing water vapor.

EFFECT OF SPEED OF PULLING JAWS ON TENSILE STRENGTH AND STRETCH OF LEATHER

The importance of measurements of tensile strength and stretch of leather is indicated by the fact that 10 of the 12 Federal specifications for different types of leather include requirements for these properties. In measuring the strength of leather, the speed of the jaws of the testing machine affects the results. In practice, speeds of the pulling jaws as low as 0.25 in/min and as high as 12 in/min are being used in different laboratories. At the Bureau, a study of this subject was undertaken by Robert B. Hobbs to obtain data on the magnitude of the effect of jaw speed.

As reported in RP1321 in the August Journal of Research, about 1,900 measurements of tensile strength and stretch were made at six jaw speeds from 0.5 to 20 in/min, using a horizontal Scott machine of the pendulum type, having a capacity of 800 lb. The effect on stretch at breaking load was erratic; the average difference between the stretch at 0.5 and that at 20 in/min was only 1 percent, which is no larger than the smallest interval read in the measurements of stretch. The tensile strength increased as the speed of the jaws increased. The rate of increase was smallest between speeds of 6 and 12 in/min.

PROPERTIES OF BUILDING AND MONUMENTAL GRANITES

D. W. Kessler, Herbert Insley, and W. H. Sligh recently completed a study of a considerable number of the granites now on the market. The report of this work which will appear as RP1320 in the August Journal of Research, covers 83 samples from eastern States, 22 samples from midwestern States, and 11 samples from western States. The samples include a few gabbros, basalts, and diorites, which are being sold as granites although they are not scientifically recognized as granites.

Physical properties determined for comparative purposes were compressive strength, porosity, absorption, and density. In order to make comparisons with other types of masonry materials, a few samples were tested for flexural strength, shearing strength, abrasive hardness, toughness, and elasticity. Certain durability studies were conducted to find what agents are mainly active in the weathering of granites.

Compressive strength was determined by applying the load perpendicular to the rift and also parallel to the rift on both wet and dry specimens. Although some granites appear to be stronger when loaded perpendicular to the rift than when loaded parallel to the rift, the average of all tests perpendicular was approximately the same as the average of all tests parallel. The average compressive strength for granite, as indicated by tests on all samples in the dry condition, was 24,500 lb/in^2. Individual results of over 60,000 lb/in^2 were obtained on the stronger materials, while very few samples tested below 10,000 lb/in^2.

The average porosity of all samples was 1.29 percent, and the range obtained was 0.40 to 3.84 percent. Absorption tests were made for three periods of immersion, namely, 48 hours, 14 days, and 1 year. The results, expressed in the usual way (absorption by weight), ranged from 0.02 to 0.58 percent, with an average of 0.24 percent for the 48-hour immersion period. A few samples absorbed approximately 100 percent more water at the end of 1 year than at the end of 48 hours, but for most samples the increases at the end of 1 year were less than 50 percent. In the study of pore structures a test was devised to determine the comparative rates at which water rises through the pores of various granites. The results show a much wider range in values than either the porosity or absorption values and indicate that the test affords better information on the pore structure.

A series of freezing tests, in which the specimens were subjected to 4,500 cycles of freezing and thawing, produced no ill effects. Evidently frost action plays a very minor part in the weathering of granite. Several samples were subjected to 1,000 cycles of soaking and drying, in which the specimens were soaked for 17 hours in water and dried at 105° C. This test caused observable changes in most of the speci-

mens. In some cases cracks developed which could be readily seen, while in others the cracks were microscopic. In this test practically all of the specimens showed slight increases in weight, which indicates that certain chemical changes may have occurred, such as oxidation, hydration, or sulfation. That the cracks were not caused by thermal expansion of the individual minerals was proved by another series of tests in which the samples were subjected to a temperature cycle, ranging from 105° C to —10° C., where no moisture was involved. Two thousand cycles of this test produced no measurable changes in the specimens. A few chemical studies, made on samples of decayed granite from old buildings, indicated that the disintegration was caused by the formation of calcium sulfate in the pores. The calcium sulfate may have resulted from the action of sulfur gases, existing in the atmosphere, on the calcite impurities of the granite.

"PRECISION-BUILT" FRAME WALL AND PARTITION CONSTRUCTIONS

In collaboration with the Forest Products Laboratory, tests have been made on 63 specimens of wood-frame wall and partition constructions submitted by the Homasote Co. These incorporated insulating fiberboard as inside face, as outside face, and as sheathing.

The specimens were subjected to loads simulating those which act on the elements of a house. The deformation under load and the set after its removal were measured for uniform increments of load. The results are presented by means of graphs and tables in Building Materials and Structures Report BMS48. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

STRUCTURAL PROPERTIES OF "SCOT-BILT" PREFABRICATED SHEET-STEEL WALLS, FLOORS, AND ROOFS

Building Materials and Structures Report BMS46 describes tests on 27 specimens of "Scot-Bilt" prefabricated sheet-steel wall, floor, and roof constructions, furnished by the Globe-Wernicke Co.

The wall specimens were subjected to compressive, transverse, concentrated, impact, and racking loads; the floor specimens to transverse, concentrated, and impact loads; and the roof specimens to transverse and concentrated loads. The transverse, concentrated, and impact loads were applied to both faces of the wall specimens. The loads simulated those to which the elements of a house are subjected in actual service.

The deformations under load and the sets after its removal were measured for uniform increments of load. The results are presented in graphs and in tables. Copies of BMS46 are obtainable at 10 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

METALLIC ROOFING FOR LOW-COST HOUSE CONSTRUCTION

Building Materials and Structures Report BMS49, which has just been released, was prepared in response to many requests for information about metallic roofing materials. It describes the various types of conventional and commercially available metallic roof coverings suitable for use in low-cost house construction.

The general aspects and status of metals utilized for roofing purposes are discussed. Considerations which apply in general to all roofing materials and to metals in particular are given. Basic principles of metal-roof construction are listed, together with descriptions of the type of seams used, decks, nails, and coverings.

Galvanized sheet steel, terne, and copper roofings are treated in detail because they constitute the bulk of present-day metal roofs. The durability of galvanized sheet-steel roofings is shown by the data obtained from outdoor exposure tests conducted by the American Society for Testing Materials. Information on the maintenance of terne and galvanized roofs is given.

The price of the publication is 10 cents. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C.

SIMPLIFIED PRACTICE RECOMMENDATION FOR FILES AND RASPS

Simplified Practice Recommendation R6–40, which became effective on April 1, 1940, is the first revision of the original recommendation on files and rasps, promulgated in 1923.

The present revision, which is based on a survey of production and sales for

1938, brings the stock list down to 377 varieties, or 76 precent of the 1923 figure, and only 28 percent of the number of varieties produced prior to 1918.

In addition to the simplified schedule of types and sizes, the revised printed issue briefly outlines the development of the project, and lists the members of the standing committee and acceptors of the recommendation. Copies are obtainable at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

COMMERCIAL STANDARDS AND THEIR VALUE TO BUSINESS

Commercial Standard CSO–40, which has just been released, sets forth the background, purpose, economic necessity, scope, and procedure for the establishment of Commercial Standards. It answers as briefly as practicable the usual questions regarding their establishment and records a few examples of what has been accomplished through the certification of quality based upon established commercial standards. Copies are obtainable from the National Bureau of Standards on request.

TABLES OF CIRCULAR AND HYPERBOLIC SINES AND COSINES FOR RADIAN ARGUMENTS

The above is the title of the third of a special series of mathematical publications to be made available through the Bureau, acting as sponsor for a project conducted by the Federal Works Agency, Work Projects Administration for the City of New York. The contents are: Table I, Circular and hyperbolic sines and cosines

[0.0000(0.0001)1.9999;9];

Table II, Circular and hyperbolic sines and cosines [0.0(0.1)10.0;9]; and Table III, Conversion table.

The publication is bound in buckram and has 405 pages. The price is $2.00 to addresses in the United States and its possessions and countries extending the franking privilege; in other countries the price is $2.50. When remitting, please make check payable to the "National Bureau of Standards." Payment is required in advance; remittance should accompany order.

NEW AND REVISED PUBLICATIONS ISSUED DURING JULY 1940

Journal of Research[2]

Journal of Research of the National Bureau of Standards, volume 25, number 1, July 1940 (RP1310 to RP1317, inclusive). Price 30 cents. Annual subscription, 12 issues, $3.50.

Journal of Research of the National Bureau of Standards, title page, corrections, and contents to volume 23, July to December 1939 (RP1218 to RP1265, inclusive). Free on application to the Bureau.

Research Papers[2]

(Reprints from the April and May 1940 Journal of Research)

RP1287. Heat and free energy of formation of deuterium oxide. Frederick D. Rossini, John W. Knowlton, and Herrick L. Johnston. Price 5 cents.

RP1288. Note on the effect of pressure on the wavelengths of the international secondary standards in the first spectrum of iron. Curtis J. Humphreys. Price 5 cents.

RP1289. Separation of the aromatic hydrocarbons, and the isolation of *n*-dodecane, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene, from the kerosene fraction of petroleum. Beveridge J. Mair and Anton J. Streiff. Price 10 cents.

RP1290. Concerning the existence of fractions of the sericin in raw silk. Henry A. Rutherford and Milton Harris. Price 5 cents.

RP1291. Methods of measuring pH in alkaline cyanide plating baths. Maurice R. Thompson. Price 5 cents.

RP1292. Some observations on determining the size of pores in paper. Frederick T. Carson. Price 5 cents.

RP1294. Thermodynamic properties of sulfuric-acid solutions and their relation to the electromotive force and heat of reaction of the lead storage battery. D. Norman Craig and George W. Vinal. Price 5 cents.

RP1295. Friction and temperature as criteria for safe operation of journal bearings. Samuel A. McKee. Price 5 cents.

RP1296. Isolation of 3-methylhexane, *trans-1*, 2-dimethylcyclopentane, and *trans-1*, 3-dimethylcyclopentane from petroleum. Augustus R. Glasgow, Jr. Price 5 cents.

RP1297. Small inertia-type machine for testing brake lining. Rolla H. Taylor and William L. Holt. Price 5 cents.

RP1298. Effect of paint on the sound absorption of acoustic materials. V. L. Chrisler. Price 10 cents.

RP1299. Pectic substance in cotton and its relation to the properties of the fiber. Roy L. Whistler, Albert R. Martin, and Milton Harris. Price 5 cents.

See footnote on following page.

RP1300. Apparatus for the study of the photochemistry of sheet materials. Herbert L. Launer. Price, 10 cents.
RP1301. Redetermination of the Munson-Walker reducing-sugar values. Lester D. Hammond. Price 5 cents.

Handbooks[2]

H31. Safety rules for the installation and maintenance of electrical supply stations (Comprising Part 1 and the grounding rules of the 5th edition, National Electrical Safety Code). (Supersedes H6.) Price, 10 cents.

Building Materials and Structures Reports[2]

[Persons who wish to be notified of new publications in the Building Materials and Structures series as soon as they are available, should write to the Superintendent of Documents, Government Printing Office, Washington, D. C., asking that their names be placed on the special mailing list maintained by him for this purpose.]

BMS46. Structural properties of "Scot-Bilt" prefabricated sheet-steel constructions for walls, floors, and roofs sponsored by The Globe-Wernicke Co. Herbert L. Whittemore, Ambrose H. Stang, and Vincent B. Phelan. Price, 10 cents.
BMS48. Structural properties of "Precision-Built" frame wall and partition constructions sponsored by the Homasote Co. Herbert L. Whittemore and Ambrose H. Stang with the collaboration of George E. Heck, Forest Products Laboratory. Price, 10 cents.
BMS49. Metallic roofing for low-cost house construction. Leo J. Waldron. Price, 10 cents.

Circulars[2]

C427. Synthetic rubbers: A review of their compositions, properties, and uses. Lawrence A. Wood. Price, 10 cents.

Simplified Practice Recommendations[2]

R6-40. Files and rasps. (Supersedes R6.) Price 5 cents.

Commercial Standards

CS0-40. Commercial Standards and their value to business. (Supersedes CS0-39.) Free on application to the Bureau.

Technical News Bulletins[2]

Technical News Bulletin 279, July 1940. Price, 5 cents. Annual subscription, 50 cents.

[2] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $3.50 (to addresses in the United States and its possessions, and in countries extending the franking privilege); other countries, 70 cents and $4.50, respectively.

[3] These publications are not obtainable from the Government. Requests should be sent direct to publishers.

MIMEOGRAPHED MATERIAL

Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.]

LC596. Domestic heating and air conditioning.
LC597. Carbon paper and typewriter ribbons. (Supersedes LC424.)
LC598. Industrial utilization of waste land products; fiber structure; and pH standards: Publications by the staff of the National Bureau of Standards. (Supersedes LC451.)
LC599. Publications relating to building codes and construction practice, home building, building material specifications, and home maintenance. (Supersedes LC432.)
LC601. Sources of information on the properties of metals and alloys. (Supersedes LC533.)

RECENT BUREAU ARTICLES APPEARING IN OUTSIDE PUBLICATIONS[3]

New high-voltage laboratory of the Bureau of Standards. F. B. Silsbee. Electrical Engineering (33 West 39th St., New York, N. Y.) 59, 238 (June 1940).
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